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The standard approach in developing conditional probability is a numerically oriented one, although one notable exception has been efforts in the area of qualitative (comparative-preference ordering) probability theory, as developed by Suppes, Domotor, Fishburn, and others. However, the latter aspect of probability requires, in general, the preference ordering to be equivalent to the probability ordering. But, this is obviously too restrictive to be compatible with the basic monotonicity property of probability, relative to the usual partial subclass order for events. On the other hand, Koopman's approach to qualitative probability is not as restrictive and does yield a preference relation, which if suitably modified, is compatible with the natural subclass partial order.

In the work here, it is shown that a qualitative concept of conditional probability can be established on a thoroughly rigorous algebraic basis which can be directly related to Koopman qualitative conditional probability. In addition, it is shown that conditional events – which must be certain principal ideal cosets of events from the initial boolean algebra of events – can be compared, contrasted, and combined by any boolean operations, even if the events have distinctly different antecedents. In addition, conditional events form a conditional event algebra which in structure is midway between a pseudocomplemented distributive lattice and a full boolean algebra. This richness of structure allows for: the development of an associated sound and complete conditional probability logic of propositions; deep structural relations with three-valued logic and DeFinett's previous concept of partial indicator functions; and a novel interpretation of bayesian analysis from a qualitative/syntactic viewpoint.

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CONDITIONAL EVENT ALGEBRAS: TWO NEW CHARACTERIZATIONS AND THEIR RELATIONS TO BAYESIAN ANALYSIS

Invited presentation to the 27th Annual
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Abstract

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